INHIBITORY EFFECT OF METOPROLOL IN THE CORROSION OF MILD STEEL IN ACID MEDIA

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Abstract

The aim of the study is to investigate the inhibitory effect of Metoprolol on the corrosion of OL-45 steel in a neutral 3.5% sodium chloride media. Metoprolol is a part of the beta-adrenergic blocker class that is widely used in the treatment of angina, heart failure, and arterial hypertension. It prevents the heart and the blood vessels from being affected by adrenaline [1]. In this paper, the corrosion inhibition of the drug mentioned was caused by the presence of the aromatic ring and the functional groups that have unpaired electrons, such as the etheric group, amino group, and hydroxilic group [2]. These functional groups provide the capacity for the drug to be adsorbed on the metal surface level, thus preventing the attack of chlorine ions from the corrosive environment [3].

The corrosion behavior has been studied using electrochemical techniques such as cronopotentiometry, chronoamperometry and the Tafel polarization method at a scan rate of 1 mV s^{-1}, in the presence and absence of different amounts of the drug. Quantum chemical calculations have been performed in order to confirm the inhibitory effect of the drug studied. The basis set B3LYP/6-31G* was employed to establish the model of the electronic structure of the molecule that permits the accurate calculation of the molecular descriptors, such as E_{HOMO}, E_{LUMO}, dipole moment, ionization energy, and electron affinity [4]. The theoretical calculus confirms the inhibitory effect of the Metoprolol in neutral media obtained by the electrochemical methods. This study provides important insights for applications in saline industrial settings by highlighting Metoprolol as a viable corrosion inhibitor for OL 45 steel in NaCl conditions.

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